American Museum Novitates

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N. Y. 10024

NUMBER 2529 NOVEMBER 19, 1973

Notes on South American Black Flies of the Tribe Prosimuliini (Simuliinae, Simuliidae, Diptera)

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ABSTRACT

The present paper contains the result of the study of some prosimuliine black flies collected by the authors in Chile. The pupa of *Cnesiamima atroparva* Edwards is described and illustrated for the first time. The pupa of *Cnesiamima* was found to share derived (synapomorphic) characters with the pupa of *Paraustrosimulium*; this, together with the existence of synapomorphic structures in the genitalia of the male of the two genera, suggests that both have a common Recent ancestor not shared by any other known black fly genus. New locality data and observations on the morphology of other genera and species are also given.

The prosimuliine black flies of Mesoamerica and South America were reviewed recently by Wygodzinsky and Coscarón (1973). Nine genera were surveyed; for eight of these, the early instars as well as the imagos were described, but the monotypic *Cnesiamima* Wygodzinsky and Coscarón was known only from adults. We stated that we had failed to find the aquatic instars of this genus, but predicted that a successful search for them would be accomplished in early spring.

This prediction has been fulfilled. In the company of Mr. Luis E. Peña we visited, in the first days of October, an area of the Chilean province of

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Talca with well-developed Valdivian forest, and succeeded in finding the pupa of *Cnesiamima atroparva*, although we failed in our quest for larvae.

In addition to the description of the pupa of *Cnesiamima atroparva* and a discussion of the affinities of the genus, this paper also contains additional notes on other South American Prosimuliini.

We thank the National Academy of Sciences (Bache Fund), Mrs. A. L. Loomis, Jr., New York, and the Council of the Scientific Staff of the American Museum of Natural History; all contributed to make this trip possible. Special thanks are due Mr. Luis E. Peña for his invaluable assistance in the field. Marjorie Favreau made the drawing of the pupa of *Cnesiamima atroparva* (fig. 2).

All specimens are in the collections of the American Museum of Natural History, unless otherwise indicated.

Araucnephia montana (Philippi)

MATERIAL EXAMINED: Chile: Talca: Altos de Vilches, 1200 m., Oct. 5–7, 1972 (Coscarón, Peña, and Wygodzinsky), two males, one female, reared; Santiago: Cuesta El Chada, 550 m., Oct. 12, 1972 (Peña and Wygodzinsky), two females, reared; Río Aculeo, Oct. 12, 1972 (Peña and Wygodzinsky), one male, reared; Rungue-El Roble road, 800 m., Oct. 11, 1972 (Peña and Wygodzinsky), one male, reared, four females, biting man; Rungue-Tiltil road, 600 m., Oct. 11, 1972 (Peña and Wygodzinsky), one male; Quebrada de la Plata, Hacienda La Rinconada, Maipu, Oct. 14, 1972 (Peña and Wygodzinsky), 11 males, seven females, reared; road to Farallones, 1200 m., Oct. 4, 1972 (Coscarón and Wygodzinsky; Museo de La Plata), three males, one female, reared, pupae.

This is the first report of the species biting man.

Araucnephioides schlingeri Wygodzinsky and Coscarón

Figure 1

MATERIAL EXAMINED: Chile: Talca: Altos de Vilches, 1200 m., Oct. 5–7, 1972 (Coscarón, Peña, and Wygodzinsky), 15 males, reared, very numerous pupae and larvae; Santiago: Quebrada de La Plata, Hacienda La Rinconada, Maipu, Oct. 14, 1972 (Peña and Wygodzinsky), three females, reared; 4 km. SW of Caleu, 1100 m., Oct. 11, 1972 (Peña and Wygodzinsky), two males, one female, reared.

We found this species in very large numbers at Altos de Vilches, in a mountain stream about 4 meters wide; larvae and pupae were conspicuous on the upper surface of large stones. The water temperature was about 6° C., and the stream was partially shaded. *Cnesia ornata* also occurred here, in large numbers and in the same situation.

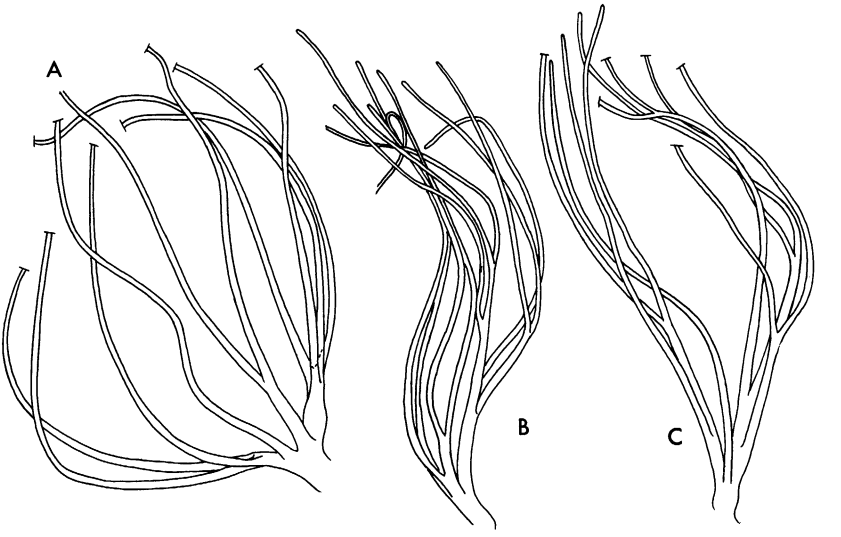

FIG. 1. *Araucnephioides schlingeri*, gills of pupa. A. Specimen from Quebrada de La Plata. B, C. Specimens from Altos de Vilches.

Wygodzinsky and Coscarón (1973) described and illustrated the gill of the pupa of this species based on specimens from the Quebrada de La Plata, near Santiago, and from Olmué, in Valparaiso; the gill of another specimen from the first locality is illustrated herein (fig. 1A). The gills of pupae from Altos de Vilches (fig. 1B, C) differ from most of those found in Santiago and Valparaiso by the somewhat more slender filaments that form one or two tight bundles, and the generally much more distally situated branching points. Occasionally, specimens from the northern localities show one gill with branches forming tight bundles reminiscent of those typical for the southern locality, or with branching more distad than usual (Wygodzinsky and Coscarón, 1973, fig. 36E) Because females were not obtained at Talca, and because the males and larvae do not seem to differ from those of the southern populations, we hesitate to give the Talca population formal taxonomic status different from that of the insects formerly described. Additional sampling is required before the taxonomic status of the various populations now included in *Araucnephioides schlingeri* can be determined definitely.

Cnesia dissimilis Edwards

MATERIAL Examined: Chile: Talca: Altos de Vilches, 1200 m., Oct. 5–7, 1972 (Coscarón, Peña, and Wygodzinsky), one male, reared, three

additional pupae; E of Talca, Oct. 7, 1972 (Coscarón, Peña, and Wygodzinsky), one female, reared; Ñuble: Chillan, Río Chillan, Oct. 10, 1972 (Coscarón), three males, one female, reared; Concepción: Rinconada Curcura, 3 km. S of Lota, mountain stream with clear water, on bamboo branches trailing in stream, Oct. 12, 1972 (Coscarón), pupae.

At Altos de Vilches this species was very rare; only four pupae were found among hundreds of *Cnesia ornata.*

Cnesia ornata Wygodzinsky and Coscarón

MATERIAL EXAMINED: Chile: Talca: Altos de Vilches, 1200 m., Oct. 5–7, 1972 (Coscarón, Peña, and Wygodzinsky), numerous pupae and larvae.

At the time of our visit to Altos de Vilches, in early spring, larvae and pupae of this species were common in the three streams examined; in some locations the pupae formed dense aggregations as does *Cnesia dissimilis* where this species is abundant.

Wygodzinsky and Coscarón (1973) expressed some doubt about the correct association of the larvae they considered as belonging to this species, because they were able to examine only very little material. We have now definitely been able to associate larvae and pupae in many cases (pharate pupae, or larval skins contained together with pupae in closed cocoons), but we are still unable to distinguish the larva of *ornata* from that of *dissimilis.*

We did not obtain female imagos, and therefore the color of the scutum in this sex continues to be unknown.

CNESIAMIMA WYGODZINSKY AND COSCARON

Pupa. Cocoon well defined, covering pupa except anterior extremity and gills; shape broadly oval, flattened, shieldlike; borders of anterior opening slightly but distinctly reinforced, especially at center, somewhat salient at middle. Cocoon without ventral layer.

Body of pupa more weakly sclerotized than in other Prosimuliini, and abdomen more weakly sclerotized than head and thorax.

Gills cigar-shaped, inserted perpendicularly on extremely short trunk at posterior third of body of gill, the gill forward and downward and somewhat laterad directed. Gills about as long as maximum width of body of pupa, with several irregularly transverse septa. Surface of gills rugose-reticulate. Gills bearing delicate scattered respiratory filaments extending perpendicularly to longitudinal axis of gill, length of filaments over twice that of diameter of gill, their surface minutely pitted, their apex slightly clavate.

Head only with 1+1 hairlike facial trichomes; no other trichomes

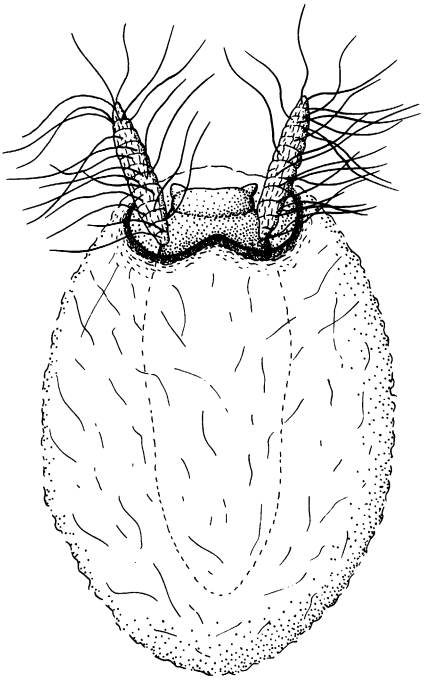

FIG. 2. *Cnesiamima atroparva*, pupa, dorsal view. Drawing by Marjorie Favreau.

present. Disc of thorax with 5–6+5–6 trichomes, the three dorsal ones in shape of apically bent strong spinelike setae, the others hairlike.

Abdomen pointed posteriorly. Distinct pleural areas not developed. Onchotaxy of abdomen as follows: Tergum I glabrous. Tergum II with several fine hairs, the 1+1 submedian ones slender, spinelike. Terga III and IV with 3+3 short hooks posteriorly. Terga V–VIII with spine-combs. Terminal spines short, sharply pointed. Sternum V with 2+2 elongate spinelike hooks. Sternal plates VI and VII with 1+1 similar hooks; 1+1 hooks also in pleural membrane of segments VI and VII. Pleural area of terminal segments with several extremely complex grapnel-shaped setae.

Cnesiamima atroparva (Edwards)

Figures 2–4

Pupa. Cocoon as in generic description, grayish brown, with distinct threads. Length of cocoon 3.3–4.0 mm., its maximum width 2.7 mm.

Total length of pupa (gills not included) 2.7–2.9 mm.; cephalopterothecal length 1.85 mm. Platelets weakly developed, perceptible only on thorax, even there ill defined.

Gills as in generic description and figures 2, 3A, B; their length 1.2–1.4, their maximum width 0.25–0.3 mm. Gills each with 13–17 septa, and with about 35 rather regularly spaced respiratory filaments; filaments inserted on spaces between septa.

Onchotaxy of head, thorax, and abdomen as in generic description and figures 3C, D, 4. Spine-combs of posterior terga with 12–14 widely spaced teeth (fig. 4G).

MATERIAL EXAMINED: Chile: Talca: Altos de Vilches, 1200 m., Oct. 6–7, 1972 (Coscarón, Peña, and Wygodzinsky), one male, reared from pupae, one pharate female, six pupae.

BIOLOGY: The pupae were collected in two crystal-clear mountain

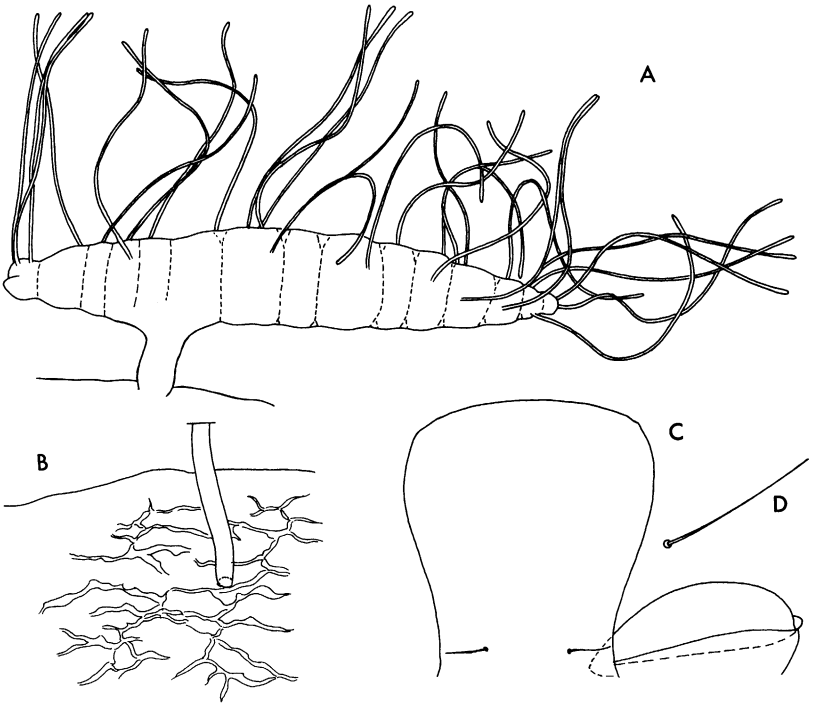

FIG. 3. *Cnesiamima atroparva*, pupa. A. Gill, side view. B. Detail of gill surface, with insertion of respiratory filament. C. Frontoclypeus. D. Facial trichome, higher magnification.

streams, one about 20 cm., the other 3 m. wide, at a water temperature of 6° C. Pupae were found singly, on the upper surface of stones or on leaves of shrubs trailing in the water. Larvae and pupae of species of *Cnesia* (mainly *ornata*) and *Gigantodax* also occurred in these streams on the same date.

DISCUSSION: In the key to pupae of Mesoamerican and South American simuliids (Wygodzinsky and Coscarón, 1973), *Cnesiamima* will key out with *Paraustrosimulium*. Both genera share the well-defined cocoon with a weak or absent ventral layer, the general chaetotaxy including the 3+3 spinelike trichomes on the dorsal portion of the thorax and the comparatively short and sharply pointed terminal spines of the abdomen. The gills are quite different superficially, those of *Paraustrosimulium* being lamellate and glabrous and those of *Cnesiamima* cigar-shaped and beset with numerous respiratory filaments. However, the gills of both genera share the presence of septa-like structures of a kind not found in any other South American black fly known to us, and, also in both genera, the gills are inserted perpendicularly on a very short stem, at approximately one-third of their total length. One could therefore interpret the basic gill structure in *Cnesiamima* and *Paraustrosimulium* as synapomorphic, with the flattening of the gills and the loss of respiratory filaments in *Paraustrosimulium* being autapomorphic.

Summarizing our interpretation of the pupal structures of *Paraustrosimulium* and *Cnesiamima* and also taking into consideration characters of the adult, one arrives at the following enumeration of features shared by *Paraustrosimulium* and *Cnesiamima*, which are apomorphic within the framework of South American Prosimuliini:

1. Median sclerite of male genitalia lamellate, geniculate in lateral view and M-shaped in frontal view.
2. Cocoon broadly oval, of well-defined shape, ventral portion obsolescent.
3. Gills of pupa compact, septate, inserted perpendicularly on extremely short trunk at posterior third of body of gill.
4. Pupal abdomen weakly sclerotized.
5. Terminal spines of pupal abdomen comparatively short and sharply pointed.

The differences between the adults of the two genera, as postulated by Wygodzinsky and Coscarón (1973), do not contradict the hypothesis, based on the numerous synapomorphic characters mentioned above, that *Cnesiamima* and *Paraustrosimulium* share a relatively recent common ancestor not shared with any other known black fly genus. We would

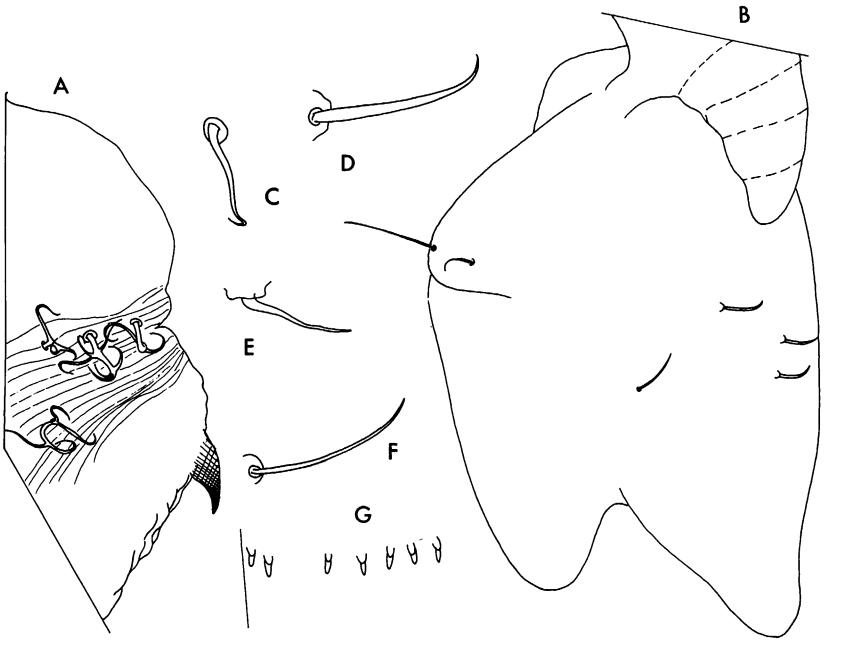

FIG. 4. *Cnesiamima atroparva*, pupa. A. Apex of abdomen, with terminal spine and grapnel-like setae. B. Portion of thorax; dorsal surface to the right. C. Pleural seta of abdominal segment VII. D. Trichome of dorsal group of thorax. E. Pleural seta of abdominal segment VI. F. Trichome of lateral group of thorax. G. Right-side portion of spine-comb of tergum VII.

therefore have established the presence of a genus-group pair for *Paraustrosimulium* and *Cnesiamima*, comparable with such groups as *Araucnephia-Araucnephioides*, *Cnesia-Gigantodax*, *Lutzsimulium hirticosta-Lutzsimulium pernigrum*, and *Mayacnephia-Tlalocomyia*, all of which are prosimuliines of Mesoamerica and South America (see details in Wygodzinsky and Coscarón, 1973).

The recent revision of *Austrosimulium* by Dumbleton (1972) enables us to compare *Cnesiamima* also to that genus. *Cnesiamima* agrees with *Austrosimulium* by the absence of spiniform setae on R_1, the mandible which is toothed on both margins, and the presence of respiratory filaments on the gill; however, these are symplesiomorphic character states and as such not significant in establishing relationships. There are no synapomorphic characters shared by *Cnesiamima* and *Austrosimulium* to the exclusion of *Paraustrosimulium*.

The discovery and study of the larva of *Cnesiamima* is crucial for the definitive analysis of its cladistic relationships.

Paraustrosimulium anthracinum (Bigot)

MATERIAL EXAMINED: Chile: Concepción: Escuadrón, 20 km. S of Concepción, on reeds in clear, 6 m. wide stream, Oct. 12, 1972 (Coscarón), pupae.

Recently, Dumbleton (1972) revised the genus *Austrosimulium*. He maintained *Paraustrosimulium* as a subgenus of *Austrosimulium*. Dumbleton's (*loc. cit.*, p. 567) "Diagram of postulated relationships within *Austrosimulium*" (but, surprisingly, not his considerations in the text) shows *Paraustrosimulium* to be the sister group of the Australian and New Zealand components of the genus. The same has previously been suggested by Wygodzinsky and Coscarón (1962). Crosskey (1969) elevated *Paraustrosimulium* to generic rank in which he was followed by Wygodzinsky and Coscarón (1973). In the case of *Austrosimulium sensu stricto* and *Paraustrosimulium*, geographic variance is associated with considerable evolutionary divergence [see discussion of characters involved in Wygodzinsky and Coscarón (1962) and Dumbleton (1972)]; this is best expressed in separate generic status for the respective groups.

Dumbleton (1972) described the pedisulcus to be present in *Austrosimulium sensu* Dumbleton, but this is misleading because this structure is not developed in *Paraustrosimulium*. Although the published descriptions and illustrations of the species of the complex clearly show the condition of the second tarsal segment of the hind leg for each taxon, its importance as a differential character has been overlooked by all authors.

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